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A Study on Nurses' Perspective Regarding Medication Errors and Use of Ehealth In Dealing With These Errors At Kenyatta National Hospital.

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Abstract:
Background*: Medications are common treatment interventions during health care provision. When used appropriately they contribute to significant improvement in the health and well-being of patients. Medication safety means getting the right medicine, right dosage and at the right time. Medication use process occurs in different steps which include selection, procurement, storage, ordering, transcribing, prescribing, preparing, dispensing, administration and monitoring. During these stages medication errors may arise which are either preventable or non-preventable. Nurses have a responsibility to ensure patient safety when administering, documenting and handling medicines and participate in taking action to reduce the risk of recurrence.*
Materials and Methods*: The study adopted a descriptive cross-sectional study design. The study population was all the nurses at Kenyatta national hospital, level 7. The study used stratified random sampling technique whereby 20 nurses were selected per ward hence a total of 80 nurses at level 7 were selected for the study research. A self-administered questionnaire was used to collect the study data. Ethical considerations of confidentiality of information obtained, anonymity in reporting study findings, voluntary participation and appropriate approvals were observed.The study was based on quantitative data, which was analyzed through descriptive statistics including percentages, frequencies and using S.P.S.S version 24.0. Tables, pie charts and graphs were used to present the findings of this study.*
Results*: Majority of the nurses (98.7%) reported to have knowledge about medication errors. Use of abbreviations, failure to document drugs after administration, and wrong time (according to 65.1%, 55.1% and 53.8% of nurses` respectively) were the most common type of errors that nurses have witnessed in level 7 at KNH. Fatigue due to excessive workload (85%), inadequate nurse: patient ratio (80%) and variety of drugs being taken by the patient (60.8%) were the leading causes of medication errors occurring. Majority of the nurses (77.5%) know about eHealth, unfortunately 31.25% do not have direct experience. 94.87% of the nurses agreed that eHealth has great potential in curbing medication errors. KNH has not adequately addressed e-Health according to 35.6%of the respondents who agreed that computerized order entry (95.7%) and computerized medication administration record (77.9%) would be great tools in reducing incidence of medication errors.*
Conclusion: *Medication errors are a common occurrence in KNH. The most common cause of medication error is nurse fatigue due to excess workload. Use of abbreviations is the most common type of medication error. E-Health has great potential to reduce incidences of medication errors.*
Key Words*: KNH; Medication errors; Nurses` perspective; e-Health.*

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I. Introduction

Medicine administration to patients is an important part of clinical nursing practice. Safety during hospitalization and especially during the medication process of a patient is one of the priorities of a nurse. Medication errors have been a long -standing factor affecting patient safety.

Nurses are considered to be the 'gatekeepers' during drug administration process and are involved in the last step in the medication process; drug administration. They are the final checkpoint incase an error occurs in the medication process. Therefore, their crucial role in the identification and prevention of medication errors cannot be under looked. Most medical institutions rely on nurses to identify medication errors; whether the nurse was the source of the error, a contributor or just an observer. Therefore, the nurse's perception of what entails a medication error and what to do once it has occurred is a very important aspect in the reduction of incidences medication errors.

According to WHO[1], the global burden of medication errors is approximately 42 billion USD. Multiple interventions have been applied before with varied success in their ability to reduce the incidence of medication

errors. WHO recognized the need for a multidisciplinary approach in reducing the incidence and impact of medication errors. On 29th march 2017 in Bonn Germany, WHO launched a patient safety campaign; medication without harm, which proposed solutions to curb the magnitude of medication errors. It aimed at reducing the incidence of medication related errors that cause harm to the patient by more than 50% in the next 5 years.

According to a study done at Kisii level 5 hospital[2] the incidence of medication errors among pediatric age groups was 75.8% with the total number of observed medication errors being 1023. This study indicates that medication errors are a significant health care problem here in Kenya and poses harm to the patient

Various approaches have been tried to minimize incidences of medication errors. Use of technology in the health sector has shown massive improvements in patient safety especially in regard to medication errors. According to DeYoung, VanderKooi and Barletta[3] introduction of barcode medication administration (BCMA) lead to a drop in the incidence of medication errors in the medical intensive care unit by 56%.

Various studies done have reported a reduction in the incidences of medication errors following the use of computerized provider order entry[4].

The adoption of eHealth system has arrayed benefits to both nurses and patients. When there is easy access to complete and accurate information to the nurse, patients receive better medical care.

Medication errors occur frequently especially in the healthcare setting[5]. What matters is the steps a nurse will take after the error has occurred to ensure that the affected patient recovers fully and to minimize chances of the medication error occurring again. Virtually, most of the nurses in health care practice have made a medication error at one point or another in their practice. However, few take relevant actions to minimize chances of recurrence and even fewer disclose to the patient's families about them. In clinical practice, human errors are common but rarely are they reported. As a result of this underreporting very little is known about their causes. Identifying risk factors and causes of medication errors is the most crucial step towards prevention. Strategies such as ensuring that the rights of medication are maintained, double checking patients' details and procedures should be adopted to avert these medication errors[6].

II. Material And Methods

Study Design: Descriptive cross-sectional study.

Study Location: This study was carried out at Kenyatta National Hospital in level 7, located at Kibera constituency, Nairobi County.

Study Duration: July 2018 to March 2019.

Sample size: 80 Nurses.

Sample size calculation: Sample size was determined by use of a formula. (Fischer 1998).

$$\frac{n=z2\ p\ (1-p)}{d2}$$

Where:

n= the desired sample size

z= the standard normal deviation usually set at 1.96, which corresponds to the 95%confidence interval

p= the proportion of the target population estimated to have the characteristic of interest based in previous studies, in my case not more than 50% will be used.

d= the degree of accuracy/absolute error, which will be 5%=0.05

So, sample size

$$= \frac{1.962 \times 0.34(1-0.34)}{0.052} = 344$$

Adjustment of the population

Where:

$nf = n/(1+n/N)$

nf= computed sample size when the target is >10,000

N= the total target population which is the number of nurses at ward 7. (approximately 100)

$nf=.344/(1+344/100)$

= 80 nurses

80/4 = 20 nurses (per ward at level 7)

Subjects & selection method: KNH offers both general medical and surgical services. level 7 is a medical unit and comprises of 4 wards that deal with medical conditions. Each ward has one admission day per week with each ward admitting approximately 15-20 patients per week. Each ward has approximately 60-70 patients bringing the total to approximately 280 patients at level 7. The average nurse: patient ratio at level 7 is approximately 1:9.

Inclusion criteria:

1. Participants were both male and female nurses at KNH ward 7 who were willing to participate in the study and had at least one year working experience.

Exclusion criteria:

1. The study excluded nurses who have practiced less than one year and were not willing to participate in the study.

Procedure methodology

A copy of questionnaires consisting of closed and open-ended questions was administered by the researcher. Pretesting of questionnaires was done at KNH level 8 which is a medical unit. Ten questionnaires were pretested. There were some typographical errors which were corrected in order to better the research study.

The researcher was responsible for administering the questionnaires to the study population. It involved seeking informed consent from the study respondents before their participation in the study. Matters of voluntary participation, privacy, anonymity and confidentiality of the data was clearly explained to them before handing over the questionnaires for filling for those who signed a written consent of voluntary participation.

After the questionnaires were filled, the researcher collected them, checked for completeness and consistency and kept them safely for data entry and analysis. Organization was done to put together questionnaires into their respective wards before coding and proceeding to analyze the data. The data was then entered into a computer protected with a password only known to the principal investigator in order to ensure confidentiality.

The study was approved by UON/KNH ethics. Permission was sought from the administration of the Kenyatta National Hospital. All the information obtained from the respondent was treated with utmost confidentiality. In Case the respondent wished to withdraw from the study, the wishes were granted without any penalty.

Statistical analysis

Data entry was done using the statistical package for social sciences version 22.0 which was used to attain the findings and analysis. Pearson's chi square test was used in determining the association between the study and the outcome variables. It was presented inform of a graph, charts and tables.

III. Result

A) SOCIO-DEMOGRAPHIC DATA OF THE RESPONDENTS

1. Age of respondents.

Most of the respondents, 60.53% were age category 22 - 30 years, 21.05% were of age category of between 31 - 40 years, 10.53% were of age 41 – 50 years while 7.89% of the respondents were of age category >51years.

2. Gender of the respondents

Majority were females with a percentage representation of 63.57% while their male counterparts had 36.25% representation.

3.Marital status.

In terms of marital status, 53.8% of the respondents were single, 40.0% married, 2.5% divorced and 3.8% widowed.

4. Religion.

Protestants were (50.0 %), Catholics31.25 %, Muslims 10.0% and the rest of the respondents worshiped in other religions.

5. Education level

In terms of education level, 46.25% were diploma holders, 35.00% were degree holders, 15.00% had an education level of up to higher diploma and 3% of the respondents had studied up to masters' level.

6. Nurses experience in the current unit

Most of the nurses, 69.74%, had less than 2 years' experience in their current unit, 13.16% had 3-4 years' experience and 7.89% had 5-6 years' experience while 9.21% had more than 7 years' experience in their current unit.

7. Work experience

Most of the nurses had less than 2 years' work experience representing 46.67% of the sample population, 29.33% had 2-5 years' work experience, 8.00% had 5-10 years' work experience, 6.67% had 10-20 years' work experience and 9.33% had more than 20 years' work experience.

B) NURSES` VIEW ON MEDICATION ERRORS THAT COMMONLY OCCUR IN THE WARD

	Extremely unlikely		Unlikely		Neutral		Likely		Extremely likely	
	N	%	N	%	N	%	N	%	N	%
WRONG PATIENT IDENTIFICATION	16	20.0%	31	38.8%	11	13.8%	21	26.3%	1	1.3%
WRONG DRUG	10	12.7%	26	32.9%	17	21.5%	20	25.3%	6	7.6%
DUPLICATE ORDER	11	14.7%	27	36.0%	18	24.0%	13	17.3%	6	8.0%
WRONG FORMULATION	6	7.6%	23	29.1%	25	31.6%	22	27.8%	3	3.8%
WRONG DOSE	14	17.7%	27	34.2%	13	16.5%	22	27.8%	3	3.8%
ADMINISTRATION TECHNIQUE ERROR	16	21.1%	24	31.6%	12	15.8%	18	23.7%	6	7.9%
USE OF ABBREVIATIOM	5	6.3%	7	8.9%	15	19.0%	25	31.6%	27	34.2%
WRONG TIME	11	13.9%	14	17.7%	11	13.9%	30	38.0%	13	16.5%
FAILURE TO DOCUMENTING ADMINISTERED DRUG	3	4.1%	11	15.1%	15	20.5%	27	37.0%	17	23.3%

KEY: N= Count. % = Percentage.

Table 1: *Nurses view on medication errors that commonly occur in the ward*

Majority of the respondents reported that Use of abbreviations, failure to document drugs after administration, and wrong time (65.1%, 55.1% and 53.8% respectively) were the most common type of errors that they have witnessed in level 7 at KNH. Wrong patient identification (58.8%) was the least likely medication error to occur at KNH.

C) KNOWLEDGE ON MEDICATION ERRORS

	Yes		No	
	Count	Percentage	Count	Percentage
DO YOU KNOW ABOUT MEDICATION ERRORS	78	98.7%	1	1.3%
HAVE YOU EVER NOTICED A MEDICATION ERROR	69	87.3%	10	12.7%
ARE YOU AWARE OF VARIOUS INTERVENTIONS TO PREVENT MEDICATION ERRORS	74	93.7%	5	6.3%
ARE YOU AWARE OF HOW TO PROCEED AFTER A MEDICATION ERROR OCCURS	62	78.5%	17	21.5%
AFTER A MEDICATION ERROR OCCURED, DID YOU REPORT IT	59	79.7%	15	20.3%
DUE TO FEAR	5	83.3%	1	16.7%
DUE TO SHAME	1	50.0%	1	50.0%
I WAS TOO BUSY	8	88.9%	1	11.1%
I DIDN`T KNOW WHO TO INFORM	1	33.3%	2	66.7%
ARE YOU AWARE OF THE REPORTING SYSTEM AND HOW TO REPORT	62	78.5%	17	21.5%

Table 2: *Knowledge on medication errors*

Majority of the respondents (98.7%) reported to have knowledge about medication errors and only 1.3% respondents indicated that they didn't know about medication errors. 87.3% of the respondents reported to have noticed a medication error, 78.5% reported that they have knowledge on how to proceed after a medication error occurs and 93.7% indicated that they are aware of the various interventions to prevent medication errors. This represents that majority of the sample population has adequate knowledge on medication errors, however only 79.7% have ever reported a medication error. Failure to report was mostly attributed to a busy schedule of the nurse.

D) e-Health

Majority of the respondents (97.47%) reported that they have basic skills and knowledge on computer use.

Computers are commonly used at KNH (88.75%) and 75% of the respondents reported to have used the internet to make a medical decision.

On knowledge about eHealth, 77.5% of the respondents have knowledge about eHealth and 40% have had some direct experience with ehealth.Unfortunately 31.25% of the respondents had no experience with eHealth.

The respondents (51.28%) reported that ehealth is important at KNH.

Ehealth can be used to reduce incidence of medical errors according to 94.87% of the respondents.

Ehealth was a topic addressed at KNH according to 65.4% of the respondents with the use of medical devices reported as the leading issue discussed by 42.9% of the sample respondents. Ehealth devices listed above were addressed in KNH according to 34.7% of the respondents.

The use of computerized order entry to order drugs is a form of ehealth that 59% of the respondents use with most of them (23%) rating it seven out of ten in its effectiveness.

Use of computerized medication administration record after drug administration is not common according to 73.4% of the respondents. Despite not using computerized medication administration record, 77.9% of the respondents agreed that it would be effective in minimizing medication errors.

E) NURSES PERCEPTION REGARDING CAUSES OF MEDICATION ERRORS.

Fatigue due to excessive workload was reported as the most common cause of medication error by 85% of the respondents. The respondents were at an impasse as to whether failures to review patient's medication history (50% of the respondents) lead to an increase in the incidence of medication errors. 63.8% of the respondents reported that inadequate knowledge on commonly used drugs was the least likely cause of a medication error due to nurse`s factors.Inadequate nurse-patient ratio was the biggest cause of medication errors at KNH according to majority of the respondents (80%). This was closely followed by 55.7% of the respondents who indicated that the management style at KNH was also to blame for the medication errors at KNH.

Incorrect transfer of medication orders was the least likely cause of medication errors according to 51.3% of the respondents.

As compared to working in other shifts, working during the night shift was associated with an increased risk of medication errors occurring according to 28.8% of the respondents.Majority of the respondents, 60.8% reported that variety of drugs used by the patient was the most likely cause of medication errors. Medication protocols in the ward at 30.4% was the least likely cause of medication errors. Majority of the respondents agreed that apart from medication protocols in the ward (31.6%) and overcrowding in the treatment room (43.8%), all the other factors were related to a significant increase in risk of medication errors occurring.At 87.6%, most of the nurses sampled agreed that improving nurse: patient ratio was a great strategy in improving medication safety. 87.5% of the sample nurses also agreed that they would intervene whenever they thought a patient was exposed to medication harm. 82.6% of the respondents agreed that use of e-Health was a great strategy to reduce the incidence of medication errors and it has immense potential to do so especially at KNH. 82.5% of the sampled nurses agreed that learning from their mistakes could also help in reducing incidences of medication errors. Only 21.3% of the respondents thought that medication errors were the most common medical error in KNH.

IV. Discussion

1. KNOWLEDGE ON MEDICATION ERRORS

The study established that (98.7%) of nurses understood what medication error meant. A study by Osborne et al (1999) in major hospitals in the United States of America and published in the journal of nursing administration had an interesting finding of 15.8% of nurses don't know what situation constitutes a medication error and 14% were not sure when to report the error. This was however contrary to our findings whereby majority of the nurses understood what constitutes a medication error and when to report.

The study further established a significant percentage of 87.3% have encountered medication errors at least once in their practice. This is supported by Eslamian (2010) who reported that 67% of nurses working in children's department reported that they have committed medication errors at least once in their working history.

After a medication error occurs, 78.5% of the respondents were aware on how to proceed. However only 79.7% reported the medication error. Failure to report medication errors was mainly due to having a busy work schedule (88.9%) and fear of legal consequences (83.39%). This was in contrast with the report by Mayo and Duncan (2004) which reported a significantly lower percentage of only 45.6% of the nurses who believed that all drug errors were reported and the reasons for not reporting were mainly due to fear of their managers and peer reactions.

Most of the respondents (93.7%) were aware of the various intervention to prevent medication errors.

Although most medication errors can be minor and not affect the patient, they need supervision and planning. Reporting medication error is an ethical duty to minimize the benefits of medical care.

2. MEDICATION ERRORS THAT COMMONLY OCCUR IN THE WARD

The most common medication errors in the ward were due to use of abbreviations (65.1%), failure to document after drug administration (55.1%) and wrong time (53.8%). According to Fadhi et al (2017) in the study done on Medication errors among nurses in teaching hospitals in the west of Iran, the most common type of medication errors was administering medication at the wrong time (24%), dosage errors (16.8%) and administering medication to the wrong patient (13.8%). The type of medication error dependents on different factors e.g. the institution and department. Medication errors will be different in a surgical ward compared to a medical ward and the types of reported errors are not the same in similar heath institutions. (Mohammad A. 2010)

3. CAUSES AND REASONS FOR MEDICATION ERRORS

According to Mayo and Duncan (2004) in their research article on survey of medication error factor from nurses perspective, they indicated that the highest score was related to department related factors, and the highest mean scores pertained to the items "the low number of nurses in respect to the patient in department" and high volume of work, environmental distracters such as the department environment being nonstandard , not having independent rooms for drugs and medication preparation, and the crowd and the noise causes nurse`s to lose part of their concentration on important occasion and consequently medication errors occur. This was supported by the study findings which revealed that the highest cause of medication error was due to nurses related factors in which (85%) was due to fatigue related excessive workload, factors related to nursing management in which they reported (80%) was because of inadequate nurse patient ratio, ward environment related factors in (60.8%) reported due to use of variety of drugs used by the patient.

A study on prevention of medical error by Rodziewicz et al (2018) explains that according to nurses view point, heavy workload, large number of critically ill patient, doctors damage and unreadable orders, the low ratio of nurses to patient and environmental conditions leading to distraction had the highest impact on medication errors in nursing. This was also in keeping with accordance to the research findings.

It was also noted that in comparison to working in other shifts, working in night shift was associated with a significant increase in the likelihood of a medication error occurrence. Johnson A, et al (2014) in his research sleep deprivation and error in nurses who work the night shift noted that 56% of the night shift nurses reported to be sleep deprived and hence were more prone to making errors when managing patients during the night shift.

Therefore, improving the working conditions can reduce the number of occurrence of medication errors before they cause injuries to patient.

4.e-HEALTH

This study depicts that majority of the respondents (77.5%) have knowledge on Ehealth and have had some direct experience with ehealth (40%). 94.87% agreed that ehealth can be used to reduce incidences of medication errors. Majority (96.15%), agreed that ehealth can be used to improve patient safety. DeYoung et al (2009) reported a significant reduction in medication errors following implementation of bar-code-assisted medication administration in an adult medical intensive care unit. It's clear that the respondents believe ehealth system surveillance and remedial intervention are important in reducing incidences of medication errors. Although ehealth has been appreciated in reducing medication errors sensitization on heath and nursing informatics needs to be improved.

V. Conclusion

1. In comparison to working in other shifts (morning and afternoon), working in the night shift was associated with a significant increase in likelihood of medication errors.
2. Types of medication errors depends on different factors e.g. type of department either surgical or medical, types of medication and environmental conditions.
3. Nurses related factors especially inadequate Nurse to patient ratio is the most prevalent cause of medication error.

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